

said control device controls exhaust of a gas in said closed chamber by said exhaust device and controls supply of said predetermined gas into said closed chamber by said gas supply device based on a relationship between said pressure change and said deformation of said protection member which are stored in said storage apparatus.--

--45. An exposure apparatus according to claim 35, comprising a control device which is connected to said deformation measuring device and controls at least one of supply of said predetermined gas into said predetermined space by said gas supply device and exhaust of said gas from said predetermined space by said exhaust device.--

REMARKS

By this Amendment, the Abstract and claims 19, 21 and 24-35 are amended, claims 1-18 are deleted, and claims 36-45 are added. Accordingly, claims 19-45 are pending. No new matter is added.

The attached Appendix includes marked-up copies of each rewritten paragraph (37 C.F.R. 1.121(b)(1)(iii)) and claim (37 C.F.R. 1.121(c)(1)(ii)).

In view of the foregoing, reconsideration of the application is respectfully requested.

The abstract of the disclosure is objected to because of legal phraseology. The Abstract is amended to delete the phraseology noted in the Office Action. Accordingly, withdrawal of the objection is respectfully requested.

Applicant notes that U.S. Patent No. 6,337,161 to Chiba et al. cited in the rejections under 35 U.S.C. §103(a) is not listed in the Notice of References Cited, PTO-892, provided as part of paper No. 10. The Examiner is respectfully requested to update the Notice of References Cited, PTO-892, to list this cited reference.

Claims 19-23 and 26-35 stand rejected under 35 U.S.C. §112, second paragraph, as indefinite. This rejection is respectfully traversed.

Independent claims 19, 24, 26, 29 and 32 are amended to recite that the predetermined gas has a low absorption characteristic of the exposure light with regard to a material which absorbs the exposure light. As such, the low absorption characteristic is defined relative to a material which absorbs the exposure light. It is respectfully submitted that this language provides a comparison point as indicated in the Office Action. Further, it is respectfully submitted that the meaning of a predetermined gas having a low absorption characteristic is clear to one having ordinary skill in the art, particularly in view of the specification.

Therefore, it is respectfully submitted that claims 19-23 and 26-35 fully comply with 35 U.S.C. §112, second paragraph. Accordingly, withdrawal of the rejection is respectfully requested.

Claims 19 and 24-25 stand rejected under 35 U.S.C. §103(a) over U.S. Patent No. 5,559,584 to Miyaji et al. in view of U.S. Patent No. 6,337,161 to Chiba et al. and further in view of U.S. Patent No. 6,153,044 to Klebanoff et al. This rejection is respectfully traversed.

Claim 19 recites an exposure method comprising: accommodating a mask, on which a protection member is provided via a frame, in a closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space; replacing a gas in said closed chamber with a predetermined gas having low absorption characteristic of said exposure light with regard to a material which absorbs said exposure light; replacing a gas in a predetermined space surrounded by said protection member, said mask, and said frame with said predetermined gas via a hole formed in said frame according to replacing the gas in said closed chamber; and irradiating said exposure light onto said mask after replacing said gas in said predetermined space with said predetermined gas, and transferring an image of a pattern of said mask onto a substrate. It is respectfully submitted that Miyaji et al., Chiba et al. and Klebanoff et al., either alone or in combination, do not disclose, teach or suggest these claimed features.

The Office Action asserts that Miyaji et al. discloses in Fig. 5 "substantially all basic features of the instant claims." However, as acknowledged in the Office Action, Miyaji et al. does not disclose a protection member provided by a frame or a gas source for replacing a gas in the space between the mask and the protection member. The Office Action asserts that these structures are well known *per se*. Applicant respectfully disagrees.

The Office Action refers to Chiba et al. as teaching a pellicle 7 provided by a frame 6 for protecting a mask 1. The Office Action refers to Klebanoff et al. as teaching a system having a reticle protecting system and at least one gas inlet such as a valve for replacing a gas in the space between the protection member and the mask. However, neither Chiba et al. nor Klebanoff et al. make up for the deficiencies of Miyaji et al. As such, even if a person skilled in the art would have been motivated to combine Miyaji et al., Chiba et al. and Klebanoff et al., the exposure method recited in claim 19 would not be achieved.

✓ In particular, claim 19 recites replacing a gas in a predetermined space surrounded by the protection member, the mask, and the frame with the predetermined gas via a hole formed in the frame. Neither Chiba et al. nor Klebanoff et al. disclose, teach or suggest this claimed feature.

As shown in Fig. 1, Chiba et al. discloses a mask (X-ray absorber 3) formed on a support film 2, a reinforcing member 4 which is bonded to a holding frame 1. A pellicle 7 is bonded to a frame 6 and mounted on the reinforcing member 4. A pellicle 11 is bonded to a frame 10 and mounted on the reinforcing member 4. The frames 6 and 10 are provided with holes 8 and 12, respectively, for pressure adjustment. However, there is no disclosure that teaches or suggests replacing a gas in the space surrounded by the pellicles 7 and 11, the absorber 7, and the frames 6 and 10 with the predetermined gas via the holes 8 and 12. The holes 8 and 12 are disclosed only for pressure adjustment, i.e. exposure of the inner space to atmosphere to prevent damage from atmospheric pressure changes.

As shown in Fig. 1 of Klebanoff et al., a thermophoretic pellicle 100 encloses both a reticle 120 and a mounting means 126. The thermophoretic pellicle 100 is provided with an aperture 135 and gas inlet means 130 which permits flow of a gas into the pellicle 100.

Klebanoff et al. does not disclose a space surrounded by a protection member, a mask and a frame, or holes in such a frame.

Therefore, absent impermissible hindsight reasoning, a person of ordinary skill in the art would not have been motivated to modify Miyaji et al. based on the teachings of Chiba et al. and Klebanoff et al. to achieve the exposure method recited in claim 19. ✓

✓ Claim 24 recites an exposure method comprising: accommodating a mask on which a protection member is provided via a frame in a closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space; replacing a gas in a predetermined space surrounded by said protection member, said mask, and said frame via a hole formed in said frame with a predetermined gas having low absorption characteristic of said exposure light with regard to a material which absorbs said exposure light in said closed chamber; and after said gas in said predetermined space is replaced with said predetermined gas, irradiating said exposure light onto said mask and transferring an image of a pattern of said mask onto a substrate. At least for the reasons set forth above with respect to claim 19, it is respectfully submitted that Miyaji et al., Chiba et al. and Klebanoff et al., either alone or in combination, do not disclose, teach or suggest these claimed features. ✓

Therefore, it is respectfully submitted that claims 19 and 24 are patentable over Miyaji et al., Chiba et al. and Klebanoff et al., either alone or in combination. Further, it is respectfully submitted that claim 25 is patentable at least in view of the patentability of claim 24 from which it depends, as well as for the additional features it recites. Accordingly, withdrawal of the rejection of claims 19 and 24-25 is respectfully requested.

Claims 20-23 and 26-35 stand rejected under 35 U.S.C. §103(a) over Miyaji et al. in view of Chiba et al. and Klebanoff et al. and further in view of U.S. Patent No. 4,737,824 to Sakai et al. This rejection is respectfully traversed.

It is respectfully submitted that Sakai et al. does not overcome the shortcomings of Miyaji et al., Chiba et al. and Klebanoff et al. with respect to claim 19. Therefore, it is respectfully submitted that claims 20-23 are patentable at least in view of the patentability of claim 19 from which they depend, as well as for the additional features they recite. Accordingly, withdrawal of the rejection of claims 20-23 is respectfully requested.

✓ Claim 26 recites *inter alia* an exposure apparatus "comprising . . . a deformation measuring device which is connected to said gas replacement apparatus and measures deformation of said protection member during replacement of said gas in said closed chamber with said predetermined gas." Claim 29 similarly recites *inter alia* an exposure apparatus "comprising . . . a pressure measuring device which is connected to said closed chamber and measures a pressure in said closed chamber . . . and a control device which is connected to said pressure measuring device and controls said gas replacement apparatus based on a result of measurement from said pressure measuring device so that a deformation of said protection member is within a predetermined range during replacement of said gas in said closed chamber with said predetermined gas." It is respectfully submitted that Miyaji et al., Chiba et al., Klebanoff et al. and Sakai et al., either alone or in combination, do not disclose, teach or suggest these claimed features. ✓

As acknowledged in the Office Action, Miyaji et al., Chiba et al. and Klebanoff et al. do not teach or suggest a deformation measuring device for measuring deformation of the reticle protection member and a controlling device for controlling a gas supply to the chamber surrounding the protection member. The Office Action asserts that it would have

been obvious to one of ordinary skill in the art to employ the surface shape controlling device of Sakai et al. to achieve the claimed features. Applicant respectfully disagrees.

Contrary to the assertion in the Office Action, the intended purpose and problem to be solved by Sakai et al. is not similar to the purpose and problem to be solved by the features recited in claims 26 and 29. Such reasoning is clearly based on impermissible hindsight.

Sakai et al. does not relate to gas replacement. On the contrary, Sakai et al. discloses a wafer chucking apparatus in which a vacuum source is used to hold a wafer 1 on a wafer chuck base 2. The shape of the wafer 1 is controlled by adjusting the vacuum pressure to control deformation of the wafer 1. This has nothing to do with gas replacement.

✓ As recited in claim 26, the deformation measuring device measures deformation of the protection member during replacement of the gas in the closed chamber with the predetermined gas. As recited in claim 29, the control device controls the gas replacement apparatus based on a result of measurement from the pressure measuring device so that a deformation of the protection member is within a predetermined range during replacement of the gas in the closed chamber with the predetermined gas. Sakai et al. discloses applying a vacuum pressure, not replacing/supplying a gas. ✓

According to Sakai et al., the shape of the wafer is maintained flat to avoid any focus deviation between the wafer surface and the plane in which the image of the mask is formed. Contrary to the assertion in the Office Action, the protection member/pellicle does not have a similar problem since the image of the mask is not to be formed on the protection member/pellicle. Thus, the asserted motivation is without a proper basis.

Therefore, it is respectfully submitted that claims 26 and 29 are patentable over Miyaji et al., Chiba et al., Klebanoff et al. and Sakai et al., either alone or in combination. Further, it is respectfully submitted that claims 27-28 and 30-31 are patentable at least in view of the patentability of claims 26 and 29 from which they respectively depend, as well as

for the additional features they recite. Accordingly, withdrawal of the rejection of claims 26-31 is respectfully requested.

Claim 32 recites an exposure apparatus comprising: a closed chamber which accommodates a mask on which a protection member is provided via a frame, said closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space; a gas replacement apparatus which is connected to at least one of a plurality of holes formed in said frame, and replaces a gas in a predetermined space surrounded by said protection member, said mask, and said frame with a predetermined gas having low absorption characteristic of said exposure light with regard to material which absorbs said exposure light. It is respectfully submitted that Miyaji et al., Chiba et al., Klebanoff et al. and Sakai et al., either alone or in combination, do not disclose, teach or suggest these claimed features.

In particular, it is respectfully submitted that none of the cited references discloses a gas replacement apparatus which is connected to at least one of a plurality of holes formed in the frame as recited in claim 32. The Office Action does not indicate any structure in any of the cited references that allegedly corresponds to this claimed feature.

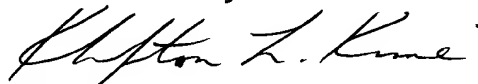
Therefore, it is respectfully submitted that claim 32 is patentable over Miyaji et al., Chiba et al., Klebanoff et al. and Sakai et al., either alone or in combination. Further, it is respectfully submitted that claims 33-35 are patentable at least in view of the patentability of claim 32 from which they depend, as well as for the additional features they recite. Accordingly, withdrawal of the rejection of claims 32-35 is respectfully requested.

New claims 36-45 are patentable at least in view of the patentability of claim 19, 24, 26, 29 and 32 from which they respectively depend, as well as for the additional features they recite.

In view of the foregoing, Applicant submits that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 19-45 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number set forth below.

Respectfully submitted,



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Attachments:

Abstract
Appendix
Petition for Extension of Time
Information Disclosure Statement

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<p>DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461</p>



APPENDIX

Changes to Abstract:

The following is a marked-up version of the amended Abstract.

An exposure apparatus ~~comprises~~includes a preliminary chamber which accommodates a mask on which a pellicle is attached, an exhaust device which exhausts a gas from the preliminary chamber, a deformation measuring device which measures the deformation of the pellicle, and a control section which regulates the amount of a gas to be exhausted from the preliminary chamber. At the time of replacing a gas in a space by exhausting the gas from the preliminary chamber, the control section adjusts the exhaust amount of the gas from the preliminary chamber based on the result of the measurement made by the deformation measurement device so that the deformation of the pellicle is within a predetermined range. This can ensure stable gas replacement while preventing the pellicle from being damaged.

Changes to Claims:

Claims 1-18 are canceled.

Claims 36-45 are added.

The following is a marked-up version of the amended claims:

19. (Amended) An exposure method comprising:

accommodating a mask, on which a protection member is provided via a frame, in a closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

replacing a gas in said closed chamber with a predetermined gas having low absorption characteristic of said exposure light with regard to a material which absorbs said exposure light;

replacing a gas in a predetermined space ~~formed between~~surrounded by said protection member, ~~and said mask, and said frame~~ with said predetermined gas via a hole formed in said frame according to replacing the gas in said closed chamber; and

irradiating said exposure light onto said mask after ~~the gas replacement~~

replacing said gas in said predetermined space with said predetermined gas, and transferring an image of a pattern of said mask onto a substrate.

21. (Amended) An exposure method according to claim 20~~19~~, wherein ~~said an~~ exhaust amount of said gas from said closed chamber is adjusted so that deformation of said protection member is within a predetermined range.

24. (Amended) An exposure method comprising:
accommodating a mask on which a protection member is provided via a frame in a closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

replacing a gas in a predetermined space formed between ~~surrounded by~~ said protection member, ~~and said mask, and said frame via a hole formed in said frame with a~~ predetermined gas having low absorption characteristic of said exposure light with regard to a material which absorbs said exposure light in said closed chamber; and

~~after said gas in said predetermined space formed between said protection member and said mask~~ is replaced with said predetermined gas, irradiating said exposure light onto said mask and transferring an image of a pattern of said mask onto a substrate.

25. (Amended) An exposure method according to claim 24, wherein a plurality of said holes is formed in said frame, and said gas in said predetermined space formed between said protection member and said mask is replaced with said predetermined gas via asaid plurality of said holes formed in said frame.

26. (Amended) An exposure apparatus comprising:
a closed chamber which accommodates a mask on which a protection member is provided via a frame, said closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

a gas replacement apparatus which is provided within said closed chamber and replaces a gas in said closed chamber with a predetermined gas having low absorption characteristic of said exposure light with regard to a material which absorbs said exposure light; and

a deformation measuring device which is ~~associated with said protection member~~ connected to said gas replacement apparatus and measures deformation of said protection member during replacement of said gas in said closed chamber with said predetermined gas.

27. (Amended) An exposure apparatus according to claim 26, wherein said gas replacement apparatus comprises:

an exhaust device which is connected to said closed chamber and exhausts a gas ~~from~~in said closed chamber; and

a control device which is connected to said deformation measuring device and controls exhausting of said gas ~~from~~in said closed chamber by said exhaust device based on a result of measurement ~~from said deformation measuring device~~ so that said deformation of ~~said protection member~~ is within a predetermined range.

28. (Amended) An exposure apparatus according to claim 27, wherein said gas replacement apparatus comprises a gas supply device which is connected to said closed chamber and supplies said predetermined gas into said closed chamber; and

said control device controls supply of said predetermined gas into said closed chamber by said gas supply device so that said deformation ~~of said protection member~~ is within a predetermined range.

29. (Amended) An exposure apparatus comprising:

a closed chamber which accommodates a mask on which a protection member is provided via a frame, said closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

a gas replacement apparatus which is provided within said closed chamber and replaces a gas in said closed chamber with a predetermined gas having low absorption characteristic of said exposure light with regard to a material which absorbs said exposure light;

a pressure measuring device which is ~~provided with~~connected to said closed chamber and measures a pressure in said closed chamber; and

a control device which is connected to said pressure measuring device and controls said gas replacement apparatus based on a result of measurement from said pressure measuring device so that ~~said~~ deformation of said protection member is within a predetermined range during replacement of said gas in said closed chamber with said predetermined gas.

30. (Amended) An exposure apparatus according to claim 29, wherein said gas replacement apparatus comprises an exhaust device which is connected to said closed chamber and exhausts a gas ~~from~~in said closed chamber; and

said control device controls exhausting of said gas ~~from~~in said closed chamber by said exhaust device so that said deformation of said protection member is within a predetermined range.

31. (Amended) An exposure apparatus according to claim 30, wherein said gas

replacement apparatus comprises a gas supply device which is connected to said closed chamber and supplies said predetermined gas into said closed chamber; and

said control device controls supply of said predetermined gas into said closed chamber by said gas supply device so that said deformation ~~of said protection member~~ is within a predetermined range.

32. (Amended) An exposure apparatus comprising:

a closed chamber which accommodates a mask on which a protection member is provided via a frame, said closed chamber having at least one of a first space including an optical path of exposure light and a second space adjacent to said first space;

a gas replacement apparatus which is ~~provided with said closed chamber~~ connected to at least one of a plurality of holes formed in said frame, and replaces a gas in a predetermined space formed between ~~surrounded by~~ said protection member, ~~and said mask, and said frame~~ with a predetermined gas having low absorption characteristic of said exposure light with regard to material which absorbs said exposure light; and

~~a deformation measuring device which is associated with said protection member and measures deformation of said protection member.~~

33. (Amended) An exposure apparatus according to claim 32, wherein said gas replacement apparatus is disposed in ~~said~~ space adjacent to ~~said~~ space including said optical path of said exposure light.

34. (Amended) An exposure apparatus according to claim 33, wherein said gas replacement apparatus comprises ~~an exhaust device which is connected to said frame and exhausts said gas from said space formed between said protection member and said mask, and~~ a gas supply device which is connected to ~~said frame~~ at least one of said plurality of holes and supplies said predetermined gas into said predetermined space, and an exhaust device which is connected to a hole which is different from the hole connected to said gas supply device and supplies said gas in said predetermined space thereto ~~formed between said protection member and said mask.~~

35. (Amended) An exposure apparatus according to claim 34, ~~further comprising a control apparatus which is connected to said deformation measuring device, which is connected to said gas replacement apparatus and measures deformation of said protection member during replacement of said gas in said predetermined space with said predetermined gas and controls at least one of supply of said predetermined gas into said closed chamber by said gas supply device and exhausting of said gas from said closed chamber by said exhaust device so that said deformation of said protection member is within~~

~~a predetermined range.~~